

THURSDAY, JANUARY 29, 1903.

SCIENCE AND THE NAVY.

THE Board of Admiralty are to be entirely congratulated upon their new scheme of entry, education and training of officers, which has recently been printed *in extenso* in the *Times*, and already given rise to much comment on the part both of naval officers and school-masters.

The most important parts of it, from our point of view, are that it shows that, in the opinion of the Admiralty, for the naval service the education obtained by studying things instead of books is essential, and that the scheme set forth is sound and broad in its educational details. The mere existence of it for the purpose intended is certain in time, we believe, to have a profound effect, not only upon the entrance examinations to the Army and the Civil Service, but upon secondary and university education generally. We may go further and say that if the Council of Defence were anything more than a name, the naval scheme would have formed part of a more general one embracing the whole armed service of the country.

Let us see what improvements are proposed upon the present system. First of all, a battleship is to be made more of a fighting unit than it is at present by having all the officers, whether navigating, gunnery, torpedo, engineer, and those more numerous lieutenants whose duties are not specially devoted to any particular branch, but excepting medical officers and the accountant branch, educated alike up to a certain point. The Army is a non-scientific body with scientific corps; the Navy is to be a scientific body all round.

At present, the marine officers enter late after the often soul-destroying training of the ordinary schools which provide the officers of the Army. The engineer officers enter earlier at a special naval engineering establishment. The executive officers enter the *Britannia* at the age of $14\frac{1}{2}$ to $15\frac{1}{2}$ for four terms, and we believe the instruction given in the first three is something like this:—

Mathematics, including Navigation	}	30½ hours a fortnight.		
and Chart Work				
French	...	6	"	"
Steam	...	4	"	"
Mechanical Drawing	...	3½	"	"
Instruments	...	3	"	"
Physics	...	1	"	"
Naval History	...	1½	"	"
Seamanship	...	6½	"	"

In the fourth term, the cadets are sent for a cruise, and are further instructed in practical navigation, instruments and chart work, steam and seamanship.

It will readily be gathered, then, that on the present system, in the schools which furnish the cadets, not much attention need be paid to physical science and the mental training that it brings, if *one hour a fortnight* is all that is provided for it on the *Britannia*.

Under the new scheme, all the officers to whom reference has been made will enter the *Britannia* between the ages of twelve and thirteen, thus saving some two years of ordinary school training. As the age is so low, nomination and a limited competitive examination are preferred

to an open examination. This, we consider, is justified, but some alterations seem desirable with regard to the nominations.

The scheme, in the first place, provides that these nominations are to be limited generally to the First Lord, with certain privileges, elaborately set out, conferred upon individual members of the Board, secretaries, flag officers, commodores and captains. This looks too much as if the Navy were looked upon as an Admiralty preserve. We can imagine, although Sir Michael Hicks-Beach has so far made no revelations with regard to the Navy, that the officers who have to look after promotions may think, as we think, that the nominations should be exclusively in the hands of the First Lord and of the Prime Minister, for it is a question of the whole country with all its interests. The principle of heredity may be pushed too far, for captains will be admirals when their nominees come up for promotion as commanders, and this fact is quite enough, human nature being what it is, to suggest how undesirable the so-called privileges are.

Then comes another point. The payment for each cadet entered is 75% per annum, but the Lords of the Admiralty reserve the power of reducing this to 40% in the case of sons of naval, army, or marine officers, or of the civilian staff at the Admiralty.

If the whole Navy and Army, why not the whole Civil Service? and, indeed, why limit the concession to the public services when good cause can be shown for an extension? The more rigid the limitation the less certain the capture of future Nelsons, and the more justification will be given to a possible outcry that the Navy is being made a close preserve for the well to do.

Were the limit extended, a natural sequel would be to enter originally for the *Britannia* a larger number of boys—say some 30 per cent.—than would be wanted for the service, admitting the required number of these to the service by strict open competition at the end of the *Britannia* period and rejecting the rest. In this way, some objections to the nomination system at entry will be met. If only a few are rejected as under the proposed scheme it would be a stigma, whereas if the number is larger it would only be considered a misfortune, and the rejected would have had the best education in England, one fitting them for any walk in life, as we shall show.

We can have nothing but praise for the subjects chosen for the examination for entrance to the *Britannia*, which are as follows:—

PART I.

- (1) English (including writing from dictation, simple composition, and reproduction of the gist of a short passage twice read aloud to the candidates).
- (2)—(a) History and (b) Geography—
 - (a) History (simple questions in English History and growth of the British Empire).
 - (b) Geography (simple questions, with special reference to the British Empire).
- (3) French or German (importance will be attached to the oral examination).
- (4)—(a) Arithmetic, and (b) Algebra—
 - (a) Arithmetic (elementary, including vulgar and decimal fractions).
 - (b) Algebra to simple equations, with easy problems.

- (5) Geometry (to include the subject-matter of the first book of Euclid, or its equivalent in experimental geometry and mensuration. The use of instruments and of algebraical methods will be allowed).

PART II.

(One only to be taken.)

- (6) Latin (easy passages for translation from Latin into English and from English into Latin, and simple grammatical questions).
 (7) A second modern language (of which, if not French or German, notice must be previously given), or an advanced examination in the language selected under Part I.
 (8) Experimental science (easy questions with the object of testing practical knowledge and powers of observation).

The cadets are to remain four years in the *Britannia*, the instruction comprising an extension of the present course there, and we rejoice at the promise that the present one hour a fortnight for physics is to be replaced by a "thorough elementary instruction in physics and marine engineering, including the use of tools and machines." This, of course, means that there are to be laboratories and practical work, for book-work alone in such subjects is next to useless. Part of this instruction is also to be carried out afloat.

Such a course as this must not only give the cadets a good grounding in the subjects necessary to their profession, but such a mental training as is sure to lead to that brain-power which lies at the root of all good organisation and administration.

After these four years, the cadets will go to sea and become midshipmen. We are told in Lord Selborne's memorandum,

"Special attention will then be paid to their instruction in mechanics and the other applied sciences and to marine engineering. The instruction of the midshipmen in seamanship will be given, as at present, by an executive officer deputed by the captain; otherwise it will, under the general responsibility of the captain, be supervised by the engineer, gunnery, marine, navigating and torpedo lieutenants of their respective ships; they will be examined annually as to their progress in seamanship, navigation and pilotage, gunnery, torpedo work and engineering, all set papers being, as at present, sent from the Admiralty."

At the end of three years, every midshipman who has passed the qualifying standard at the last annual examination and the final examination in seamanship will become an acting sub-lieutenant, and if abroad return to England and proceed to the College at Greenwich for a three months' course of mathematics, navigation and pilotage, followed by an examination, and afterwards to Portsmouth for a six months' course in gunnery, torpedo and engineering, at the close of which he will be examined, and on passing out be confirmed in the rank of sub-lieutenant.

How the cadets are to be sent to sea is not yet settled. Either they will serve for the whole three years as midshipmen to battleships and cruisers, ordinarily commissioned, or the first part of this period will be passed in specially commissioned training ships. It is quite decided that at whatever period they are posted to ordinarily commissioned battleships and cruisers, compulsory school on board these ships shall cease.

The young officers who will pass out of the college at Portsmouth between the ages of nineteen and twenty will all have received exactly the same scientific training, and will have had opportunities of displaying their powers of organisation and of dealing with men.

We are not yet told what the common training is to be at Greenwich or at Portsmouth. We believe the present course for sub-lieutenants is somewhat as follows:—

PART I.

Length of course	8 weeks.	
Subjects.					
Mathematics	...	$\left\{ \begin{array}{l} \text{Trigonometry,} \\ \text{Mechanics,} \\ \text{Navigation,} \\ \text{Instruments.} \end{array} \right\}$			21 hours a week.
Steam	2	"
French	2	"
Surveying	3	"
Physics	3	"
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PART II.

Length of course	11 weeks.
Mathematics	{ Advanced Pure Maths., Statics, Hydrostatics, Dynamics, Navigation. }			27 hours a week.
Physics	{ 1 hour lecture. 3 " practical.
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PILOTAGE.

Length of course	6 weeks.
	28 hours a week.			

Now the differentiation begins. It seems to be as follows:—

Executive officers	{ Special navigation,
	" gunnery,
	" torpedo,
	Unspecialised,
Engineer officers,	
Royal Marine officers,	

and the object to be kept in view is stated to be to make them fit to perform those specialised duties which are the product of modern science; nothing is said about those officers who have no specialised duties.

The Executive Branch.

On this differentiation, all officers ranking as sub-lieutenants will go to sea for two years.

The next phase is that after two years at sea all the executive sub-lieutenants will be promoted to the rank of lieutenant on gaining the same qualifying watch-keeping certificate as at present. All those who have passed their examinations exceptionally well will, as now, receive accelerated promotion. Then comes a selection by the Admiralty of those among them who are to be trained as specialists in gunnery, torpedo work or navigation; these will go to the Royal Naval College at Greenwich for special courses. We presume that this "selection" for training as specialists represents a promotion for those so selected.

After five years' seniority in the rank of lieutenant, all officers will have to pass an examination for promotion to the rank of commander in certain technical subjects.

These are :—

Court-martial procedure,
International law,
Knowledge of British and foreign warships, guns,
torpedoes, &c.,
Naval history,
Signals,
Strategy,
Tactics and battle formation.

This examination as it exists at present in the scheme is to be undergone alike by those who are engaged in the specialised scientific duties in the ship, with all their responsibilities, and those—under existing practice a much larger number—who have under the scheme no specialised scientific duties. Now it is obvious that these latter will be under much better conditions for preparing for an examination, and that the former will have no opportunity of letting their specialised duties tell in the examination, so that the effect of it will be to favour the promotion of those who were not selected to perform specialised duties.

The Engineer Branch.

On this differentiation, the engineer officers, sub-lieutenants about the age of nineteen, instead of going to sea for two years like the executive officers, will go to the college at Keyham for a professional course, the exact duration of which will be subsequently determined. At the expiration of this course, a proportion will be selected to go to Greenwich for a further course, while the remainder go to sea. They will then, if found qualified, all be promoted to be lieutenants under the same conditions as the executives. The nature and duration of the special course at Greenwich will be very carefully determined, and an opportunity will be afforded to those officers selected for it to make themselves acquainted with the latest developments of engineering science, not only at Greenwich, but at the great civil engineering establishments and institutions which are to be found in the country.

The engineers are now to be put on an equality with the executive officers, the ranks and uniform being assimilated, but with a difference, for while the executive officers specially trained for navigation (N), gunnery (G) and torpedo (T) lose these letters when promoted to be captains, the engineers are to retain the special (E) to the rank of Rear-Admiral (E), and as a solatium for not being allowed to command a ship are to receive higher pay and are promised "high appointments." Whether this arrangement will be carried out when the time comes, some twenty years hence, the future will show. In all the discussions on the complexity of the machinery of the modern man-of-war, the as great or greater complexity of the old sailing three-decker seems to have been entirely lost sight of.

The Royal Marines.

With regard to the sub-lieutenants drafted to the Royal Marines, we read as follows :—

"After his final examination as sub-lieutenant along with the future executive and engineer officer, the young Royal Marine officer will receive his special military training during the next two years partly at the college at Greenwich and partly at the headquarters of divisions or the dépôt; the training of all these officers will be

extended so as to correspond more closely to the training now received by the young officers of the Royal Marine Artillery; and after this two years' training, the young Marine officer will receive the rank and pay of lieutenant of marines so as to put him financially on an equality with the executive sub-lieutenant. As in the case of the executive lieutenants, specially good officers will qualify as gunnery and torpedo lieutenants, provided that they have kept watch at sea for one year, have passed the test examination for qualifying for gunnery and torpedo lieutenants, and have been specially selected and recommended. . . . The future Royal Marine officer will thus become available for keeping watch at sea and for general executive duties on board ship up to and including the rank of captain of marines."

Such is a short abstract of a scheme which we believe will be of the utmost value to the Naval Service. Educationally and scientifically, it has so much to recommend it that its authors, and chief among them, Lord Rosebery tells us we must hold Sir John Fisher, are to be warmly congratulated.

Only one conclusion can be drawn from the scheme as a whole; many of the anticipated difficulties will have vanished before it comes into full operation some ten years hence, and the effect of the practical work in pure science now to be generally introduced for the first time, and the opportunities the officers will have of becoming acquainted and being responsible for every class of duty, both scientific and administrative, will weld them into a homogeneous body each member of which should have had his brain-power so thoroughly developed that the greatest scientific skill will generally be combined with the highest powers of organisation. At present, it would seem, the very opposite is the case, for otherwise the present Admiralty system of promotions cannot be defended. Nor is the difference in the treatment of the various branches limited to the promotions. Certain lieutenants are at present selected for certain specially scientific duties; this leaves a large residuum not so selected. Special allowances are given to the navigating, gunnery and torpedo lieutenants in a ship, but the first lieutenant, who may be taken as the representative of the large body of non-specialists, not only gets a smaller allowance, but has to spend money in eking out the Admiralty's meagre supply of paint.

The allowance paid to the navigating officer is the highest, and it might be assumed, therefore, that his duties are considered important; but what happens to him? We are informed that of 187 commanders promoted captains between June, 1892, and June, 1902, only 16, that is 1 in 11, have specially studied navigation and all that navigation means, and had the real handling of battleships in tactical exercises. Further, that these 16 have been promoted so late that none of them, in ordinary circumstances, can become admirals on the active list.

Recent sad experiences both with flag-ships and smaller craft—100 "accidents" to torpedo boats and t.b.d.'s in two years—have taught us that the best admiral and the best commander even of a torpedo boat will be he who knows most about what ships can do in various circumstances and how to make them do it. The most instructed navigator will always be the safest tactician. Leading a great fleet into action and drilling men in the

duties performed in a single ship are vastly different affairs.

The present system, however, as we have seen, bars the promotion of a navigating officer to the higher ranks. So that all the admirals, the future leaders of our battle fleets, eventually to be selected from among the 187 captains to whom we have referred, will be the least instructed and least practised in navigation and all that navigation means in the way of handling ships.

We are told that information with regard to the promotion of gunnery and torpedo officers is much more difficult to obtain, but this is of little importance, as their functions are necessarily limited to single ships and can have no bearing on tactics or the leading of fleets into action.

To the plain man, this result seems curious. Other reasons than that we have suggested have been given, but whatever the reason may be—we are not concerned either to attack or defend the Admiralty—we may hope that under the new system the apparent paradox will disappear, and it seems a pity to wait until then.

There is one part of the scheme of instruction which calls for criticism in a scientific journal. We read of special schools of gunnery, engineering and torpedo work, but no school of navigation is referred to.

It is a question whether an officer who has been generally trained and has been six years at sea will derive any benefit from going to a land college to learn navigation. What is really wanted to complete the scheme on true scientific lines is a navigation school afloat at this period of the officer's career where each member of the batch could take charge, under proper supervision of course, not only in tideways and strong currents, among traffic and in entering and leaving harbours, but in the open Atlantic.

This condition might be utilised by sending Marconi ethergrams, which would not only enable the Meteorological Office vastly to improve its service, but would give the young officers an interest in meteorology, a science which is still important to those who go to sea, though we find no reference to it in the memorandum.

Another important point that would be gained by this method of procedure would be to teach the officer that the roll of his ship will depend to some extent upon its presentation to the sea running at the time, so that there will be courses on which the fighting platform can be made more stable than on others. With homogeneous fleets, this may replace the "getting to windward" of old days preparatory to a naval engagement.

A PSYCHOLOGIST ON EVOLUTION.

Development and Evolution; including Psychophysical Evolution, Evolution by Orthoplasia, and the Theory of Genetic Modes. By James Mark Baldwin, Ph.D. Princeton, Hon. D.Sc. Oxon., LL.D. Glasgow, Stuart Professor in Princeton University. Pp. xvi + 392. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1902.) Price 10s. 6d. net.

THE theory of evolutionary method to which the name of "Organic Selection" has been generally applied was independently originated by Profs. Baldwin, Osborn and Lloyd Morgan. It has been accepted in its main

features by many leading biologists, who see in it a probable interpretation of numerous facts which have hitherto been felt as difficulties in the way of the Darwinian explanation of evolutionary processes. It has even been considered to afford a prospect of reconciliation between the Neo-Lamarckians and the impugners of the hereditary transmission of acquired characters, though there can be no doubt that for the former party its adoption would mean nothing less than the surrender of the central citadel of their position.

In the present volume, Prof. Baldwin has not only given a detailed account of the theory in all its bearings, but has also brought together in the form of appendices the original statements of the same principle by Osborn and Lloyd Morgan, besides valuable comments by other authorities, including Prof. Poulton, Prof. Conn and Mr. Headley. The reader of "Development and Evolution" is thus furnished with ample material for forming a judgment on the significance of the views summed up under the general headings of "Organic Selection" and "Orthoplasia."

The relation of these views to the theories that may be roughly grouped as "preformist" on the one hand and "Lamarckian" on the other is stated by Prof. Baldwin with admirable clearness as follows:—

"If we give up altogether the principle of modification by use and disuse, and the possibility of new adjustments in a creature's lifetime, we must go back to the strictest preformism. But to say that such new adjustments influence phylogenetic evolution only in case they are inherited is to go over to the theory of Lamarckism. Now the position is that these individual adjustments are real (*versus* preformism), that they are not inherited (*versus* Lamarckism), and yet that they influence evolution. These adjustments keep certain creatures alive, so put a premium on the variations which they represent, so 'determine' the direction of variation and give the phylum time to perfect as congenital the same functions which were thus at first only private accommodations. Thus the same result may have come about in many cases as if the Lamarckian view of heredity were true. The general principle, therefore, *that new adjustments effected by the individual may set the direction of evolution without the inheritance of acquired characters* is what was considered new and was called organic selection." (Italics Prof. Baldwin's.)

In claiming elsewhere that the "broader principle of organic selection from certain points of view is new," the author is careful to allow that it was not only in some degree foreshadowed by Darwin, but that in the special instance of "social heredity" (better called "social transmission") its importance has been emphasised by Wallace and other writers. "Of course, to us all," as Prof. Baldwin says, "'newness' is nothing compared with 'true-ness'"; nevertheless, the credit undoubtedly belongs to him of having independently discerned the real significance in evolution of individual adjustments, and of having been perhaps the first to put the relation between ontogeny and phylogeny, and between organic and social evolution, on a basis that should be satisfactory at once to the biologist and the philosopher.

It must not be forgotten that Prof. Baldwin is primarily a psychologist, and is apt to consider evolutionary questions largely from the psychological standpoint. In expounding his idea of the "psychophysical unit"; in his